foliaged sea-cliffs"; and that the peregrine falcons still occupy the ancient eyries in which they were protected for 300 years, although now their names are, strangely enough, not among those scheduled in the Wild Birds Protection Act. On the other hand, they will note with regret the extinction of the rock-dove and of the shearwater (which derives its name from the island), which were once so abundant among its cliffs.

This volume, if not perhaps quite up to the standard of some others of the series, is a conscientious and careful contribution to the natural history of Man. It is beautifully illustrated by two maps, as to the excellence of which no more need be said than that they are by Bartholomew, of Edinburgh, and by fifty full-page blocks of Manx scenery (most of them of favourite nesting-places of different species), a specimen of which, by the publisher's courtesy, is here reproduced. F.

THE BEAUFORT SCALE.[1]

ABOUT a hundred years ago, Admiral Beaufort, having felt the want of some scheme by which the winds could be classified according to their force, devised a plan which has been in uninterrupted use ever since. In the absence of mechanical anemometers he had to trust to personal experience and the observed effects of wind on the objects moved by it. As a sailor, he naturally selected ships as the objects moved. Calling a calm zero, and representing a hurricane, or a wind in which no ship could carry any canvas, by 12, he endeavoured to assign the intermediate numbers to winds the force of which could be gauged by the amount of sail that a well-conditioned ship of specified rig could carry. In the lapse of time sailing ships altered their rigging or disappeared altogether, with the result that the gallant Admiral's nomenclature became obsolete or unmeaning. Anemometers depending upon the application of some mechanical principle came into general use, and from the fact that these instruments gave a continual record, right or wrong, their register tended to supersede a plan, which relied simply on tradition and probably varied in individual observers. But it has always been felt that there existed some relation between the records of the anemometer and the Beaufort Scale, and various authorities have attempted from time to time to bring the two into accord, or to supply the means of expressing any given number in the Beaufort Scale as velocity reckoned in miles per hour. These well-meaning attempts have not enjoyed the unquestioned confidence of meteorologists, nor have they ensured uniformity in practice. Of late the Meteorological Office has instituted a rigorous inquiry into the estimates of wind force as made in the Beaufort plan and as recorded by anemometers, and have now issued their report.

A preliminary question presents itself to which it is difficult to give a completely satisfactory answer. Is the Beaufort Scale worth preserving? or, in other words, relying as the scale does on personal experience, is it capable of being reproduced with sufficient accuracy to ensure the maintenance of constancy in all circumstances and in all localities? This question must have presented itself to the Meteorological Office and been answered in the affirmative. The decision taken is probably justified. In many positions at sea it is not possible to use mechanical anemometers. In lawsuits and Board of Trade inquiries the vocabulary of the Beaufort Scale is in frequent use, and nautical assessors have to attach a definite meaning to it. On the other hand, are we sure that the automatic registration by anemometers has been correctly interpreted? Dr. W. N. Shaw himself raises the question whether the hourly velocity is a suitable element for comparison. It is probably the best that can be done, but it may be that we are trying to compare a scale of doubtful utility with a record that is only imperfectly understood.

The anemometers in use in this country are of two kinds, that known as the Robinson, which gives us with accuracy the number of times that a system of hemispherical cups rotates in any specified interval, when mounted in a particular manner. The error, or possible error, in the use of this apparatus enters when we pass from the velocity of the cups to that of the wind. For years it was assumed that the wind velocity was three times that of the cups, a round number which of itself suggested that it was a rough approximation. The factor 2·1 or 2·2 is now proposed as more appropriate. But there is this further difficulty: that while the velocity of the wind in an hour is not constant, the method of registration smooths out the irregularities, so that the variations in the velocities become indistinguishable in the record. The other form of anemometer, known as the Dines Pressure Tube, shows the variation in the wind velocity by recording a succession of oscillations of considerable magnitude. The trace is such as results from a pen moving vertically with comparative rapidity over paper moving more slowly horizontally. To determine the mean velocity from this trace is a matter of some uncertainty. The eye naturally selects a line which may be taken as representing the mean velocity during the interval under examination. But the number of miles per hour indicated by the position of this line can only be known from experimental inquiry. These experiments have been conducted by Mr. Dines in an exhaustive manner, but the results must nevertheless be considered as empirical. It is upon these experiments that the constant for the Robinson anemometer has been changed. Finally, therefore, the problem resolves itself into reading the results derived from the experiments of Mr. Dines into the phenomena observed by sailors and others in deciding on the numbers used in the Beaufort Scale.

But assuming that the hourly wind velocity is correctly known at any moment, it would seem a tolerably simple matter to assign to each of the Beaufort numbers the corresponding wind velocity. We have simply to take the mean value of the velocities for all winds estimated as being of a given Beaufort number to get a scale equivalent in miles per hour. This has been done more than once, and a table of such equivalents has been issued under the sanction of the Board of Trade. Such a simple solution, however, by no means disposes of all the difficulties. Prof. Köppen pointed out that a different scale of equivalents was obtained, when the mean value of all the velocities assigned by estimate as of a given Beaufort number was taken, from that which resulted from taking the mean of the Beaufort numbers corresponding to given velocities. The first method of treatment may be described as that of Curtis, the second as that of Köppen. To explain the cause of the difference betwen the two methods was the problem submitted to Mr. G. C. Simpson, and very ably he has dealt with it. Unfortunately we cannot follow him in his details; we can only point out some of his results. The following table shows the relation between the Beau-

[1] "Report of the Director of the Meteorological Office upon an Inquiry into the Relation between the Estimates of Wind-Force according to Admiral Beaufort's Scale and the Velocities recorded by Anemometers belonging to the Office; with a Report by G. C. Simpson, M.Sc., and Notes by Sir G. H. Darwin, W. H. Dines, and Commander Hepworth." (Printed for His Majesty's Stationery Office. London, 1906.)

fort Scale numbers and the wind velocity measured in miles per hour as derived from the methods of Curtis and Köppen.

Beaufort	Miles per hour		Beaufort	Miles per hour	
No.	Curtis	Köppen	No.	Curtis	Köppen
0	3·0	0·0	6	24·5	28·0
1	5·0	2·0	7	30·0	34·5
2	8·0	6·0	8	36·0	42·0
3	11·0	10·5	9	44·0	50·0
4	15·0	16·0	10	53	59·0
5	19·5	22·0			

Mr. Simpson not only shows the reason for the discrepancy between these two sets of numbers, but discusses the special problems to which each set is applicable. This part of the report is particularly interesting, since it displays the intricacy of the problems connected with anemometry. Besides the difficulties of a theoretical character, there is the additional fact that the scale is not sufficiently definite, nor the estimates sufficiently accordant, to warrant the presentation of an authoritative table of equivalents applicable to each number of the Beaufort Scale, and the Director contents himself with offering a less detailed statement which for practical purposes expresses the relation between Beaufort numbers and hourly velocities.

Beaufort Scale Nos.	Corresponding Wind	Limit of hourly velocity
0	Calm	Under 2
1–3	Light breeze	2–12
4–5	Moderate wind	13–23
6–7	Strong wind	24–37
8–9	Gale	38–55
10–11	Storm	56–75
12	Hurricane	Above 75

This table shows that 12 was too high a number, or the steps of the scale too small. The difference of velocity must be considerable before it becomes apparent to rough methods of observation.

W. E. P.

PROF. METSCHNIKOFF'S HARBEN LECTURES.

THE Harben lectures of the Royal Institute of Public Health have just been delivered by Prof. Elie Metschnikoff, of the Pasteur Institute, Paris, and Foreign Member of the Royal Society. The lectures, which contained matter of the greatest interest, and were admirably delivered, attracted large and appreciative audiences.

In the first lecture, delivered on May 25, Prof. Metschnikoff directed attention to the fact that persons may harbour disease germs without themselves manifesting any ill effects. A notable instance of this is the case of a woman, the proprietress of a bakery, who suffered from typhoid fever ten years previously, and whose employees always suffered from more or less gastro-intestinal disturbance, two of them dying from typhoid fever. Investigation proved that this woman was excreting numbers of typhoid bacilli. Why should such an infected person remain apparently well? Undoubtedly because she had acquired an immunity, the result of modifications of living parts of the body, in all probability of the phagocytic cells. All the evidence points to the phagocytes being the great line of defence against disease germs. Recently Dr. Wright advanced the hypothesis that the fluids of the body prepared the microbes for ingestion by the phagocytic cells by means of substances named *opsonins*; but experiments were quoted suggesting that phagocytosis takes place without any addition of opsonins. All observations lead to the conclusion that immunity against infective agents is the result of phagocytic action, is a function of the cells.

Persons addicted to alcohol are far less resistant to infective diseases than abstemious individuals, and experiments show that animals subjected to the influence of alcohol become more sensitive to harmful microbes, because the alcohol has a deleterious action on the phagocytes. It was therefore suggested that it might be wise to eschew alcohol (and other drugs) in the treatment of infective diseases. On the other hand, normal blood-serum and weak saline solutions increase the resistance towards pathogenic microbes, and cases were quoted showing the beneficial action of these substances in grave cases of disease and in major operations.

The second lecture, delivered on May 28, was on the hygiene of the alimentary canal. In all probability microbes frequently gain access to the circulation through the intestinal wall, and Prof. Metschnikoff supported the view that the virus of tuberculosis frequently gains access to the body by this portal. Parasitic worms are also a source of danger, and many cases of appendicitis can be ascribed to this cause. The data collected indicates that it is high time to undertake a campaign against the entozoa. To obviate the risk of intestinal infection, much may be done by taking cooked food only—boiled water and milk, boiled vegetables, cooked and not raw fruit, and no raw salads. The precautions suggested may appear difficult to carry out, but, once accustomed to them, they enter into practice without difficulty.

The third lecture, delivered on May 30, was devoted to a consideration of hygienic measures against syphilis. It was pointed out that the sufferers from this malady are very largely innocent victims. The subjects of anti-syphilitic sera and of anti-syphilitic vaccination were considered, and it was shown that both of these are at the present time impracticable. It has been shown that apes can be inoculated with the syphilitic virus, which gives a means of testing prophylactic measures, and as a result of experiment it has been found that the application of a calomel ointment well rubbed into the seat of inoculation will prevent infection if applied within twenty hours of inoculation. The results obtained on lower monkeys and on anthropoid apes agree so well as to justify the conclusion that the same method may also serve for the prevention of syphilis in man. It has been tried with successful results in the case of a medical student who volunteered for the experiment.

No considerations of a moralising tendency should be opposed to the prevention of so disastrous a calamity as syphilis. True morality should rather contribute as much as possible to the prophylaxis of this and many another disease.

The lectures will be published in full in the forthcoming numbers of the *Journal of Hygiene*.